

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-307717

(43)Date of publication of application : 22.11.1996

(51)Int.Cl.

H04N 1/60

H04N 1/29

H04N 1/46

(21)Application number : 07-109213

(71)Applicant : RICOH CO LTD

(22)Date of filing : 08.05.1995

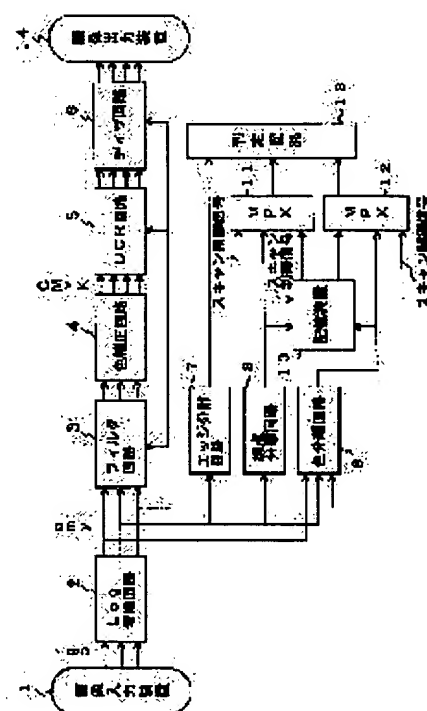
(72)Inventor : OUCHI SATOSHI
TAKAHASHI SADA0

(54) IMAGE PROCESSING DEVICE

(57)Abstract:

PURPOSE: To reduce required memory capacity while decreasing the deterioration of picture quality due to different separation results at every scan.

CONSTITUTION: The images of model K, model C, model M and model Y are generated sequentially by scanning an original for four times. A character edge, a dot and a chromatic color are detected from the original in first scan by operating an edge separation circuit 7, a dot separation circuit 8 and a color separation circuit 9. The separation result is inputted to a judging circuit 13, and also, the results of dot separation and color separation are written on a memory device 10, and they are held until following fourth scan. The judging circuit 13 generates the signals of black character, color character and pattern area based on the separation results, and processing suitable for an area is applied by a filter circuit 3, a UCR circuit 5 and a dither circuit 6. In the scan on and after second scan, the edge separation circuit 7 is operated, and the separation result is inputted to the judging circuit 13, however, the separation results of dot and color separation are inputted from the memory device 10 to the judging circuit 13.



LEGAL STATUS

[Date of request for examination] 20.02.2001

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number] 3436828

[Date of registration] 06.06.2003

[Number of appeal against examiner's decision of

rejection]

[Date of requesting appeal against examiner's decision
of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]

[Claim 1] A means to read a manuscript and to input an image, and a means to separate two or more image areas where batches differ to the image from this input means, A means to memorize the separation result of an image area separation means to process by the batch which is not the minimum batch among these batches at the time of the first image input, At the time of the first image input, the property of the predetermined field of this image is judged based on the separation result of two or more of said image area separation means. The image processing system characterized by having a means to judge the property of the predetermined field of this image based on the separation result of an image area separation means to process by said minimum batch, and the separation result of said storage means, at the time of reinput of an image.

[Claim 2] A means to read a manuscript and to input an image, and the 1st image area separation means processed per pixel to the image from this input means, The 2nd image area separation means processed in the block unit which consists of two or more pixels to this image, the time of the first image input -- this -- with a means to memorize the separation result of the 2nd image area separation means At the time of the first image input, the property of the predetermined field of this image is judged based on the separation result of each of said image area separation means. The image processing system characterized by having a means to judge the property of the predetermined field of this image based on the separation result of said 1st image area separation means, and the separation result of said storage means, at the time of reinput of an image.

[Claim 3] Said 1st image area separation means is an image processing system according to claim 2 characterized by separating an edge field per pixel.

[Claim 4] Said 2nd image area separation means is an image processing system according to claim 2 characterized by separating a halftone dot field per block.

[Claim 5] Said 2nd image area separation means is an image processing system according to claim 2 characterized by separating a white field per block.

[Claim 6] Said 2nd image area separation means is an image processing system according to claim 2 characterized by separating a photograph field per block.

[Claim 7] Said 2nd image area separation means is an image processing system according to claim 2 characterized by separating a color field per block.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention is [in / about the image processing system equipped with the image area decollator for reproducing especially a black alphabetic character to high definition in the equipment which reproduces a color picture by Junji Men like a color copying machine 1 dram type / for example, / picture reproducers, such as a color copying machine and color facsimile,] an available technique.

[0002]

[Description of the Prior Art] In the color copying machine of the equipment which reproduces an image by the plane sequence following method conventionally, for example, a 1-dram type In obtaining the copy of one sheet from a manuscript, it performs four manuscript reading scans. For example, the blue (B) read by the 1st time and the Green black (K) signal are computed from each signal of (G) and red (R). The blue which reproduced the toner image of K and was read by the 2nd time from this (B), A Green cyanogen (C) signal is computed from each signal of (G) and red (R). The blue which reproduced the toner image of C and was read by the 3rd time from this (B), The Green Magenta (M) signal is computed from each signal of (G) and red (R). A full color image is created by reproducing the toner image of M, computing the blue (B) read by the 4th time, and the Green yellow (Y) signal from each signal of (G) and red (R), reproducing the toner image of Y from this, and piling up the toner image of these K, C, M, and Y from this.

[0003] By the way, as for a black alphabetic character edge field, reproducing in black monochrome is desirable on image quality. In order to realize this, to the image generally read, image area separation processing is performed and it controls in the field judged to be a black alphabetic character field not to strike the toner of C, M, and Y.

[0004] However, when four image area separation is performed whenever it builds each ** namely, as for reading all the predetermined points in a manuscript by the same signal, it happens that separation results differ for every version with the present technique since it is next to impossible. consequently -- that cause a color blot on the black edge in an alphabetic character or a pattern, or a black edge disappears **** -- (a sake) -- like -- the phenomenon of degrading image quality occurred.

[0005] There is a color picture reader indicated by JP,3-225376,A to solve this. With this equipment, the problem [say / that judgments differ for every version] mentioned above is avoided by memorizing in memory the field judged at the time of a PURISU can to be a black alphabetic character field or a color alphabetic character field till next reading.

[0006]

[Problem(s) to be Solved by the Invention] However, with the above-mentioned equipment, in the manuscript (297mmx210mm) of A4 size, supposing it reads by 16 pixels per mm, x(297x16) (210x16) =15966720 bit (16M bit) memory space is needed. Then, in order to reduce memory space, the method of memorizing a black alphabetic character field per block unit, for example, block of about 4x4 pixels, is also considered, but when it mistakes for a black alphabetic character and judges in a picture, degradation of image quality is excessive. That is, when this phenomenon is explained in full detail, the part from which incorrect separation is started in a picture is usually the edge section. When processing called a black alphabetic character / pattern is changed for every block to this edge section, it becomes the playback image with which especially a stair-like notch is conspicuous. And in the limitation which is performing image area separation by partial processing, it is difficult to avoid the incorrect separation itself.

[0007] This invention was made in consideration of the above-mentioned situation, and the object of this invention is to

offer the image processing system which reduced required memory space, reducing degradation of the image quality resulting from a different separation result for every scan.

[0008]

[Means for Solving the Problem] In order to attain said object, in invention according to claim 1 A means to read a manuscript and to input an image, and a means to separate two or more image areas where batches differ to the image from this input means, A means to memorize the separation result of an image area separation means to process by the batch which is not the minimum batch among these batches at the time of the first image input, At the time of the first image input, the property of the predetermined field of this image is judged based on the separation result of two or more of said image area separation means. It is characterized by having a means to judge the property of the predetermined field of this image based on the separation result of an image area separation means to process by said minimum batch, and the separation result of said storage means, at the time of reinput of an image.

[0009] A means to read a manuscript and to input an image in invention according to claim 2, The 1st image area separation means processed per pixel to the image from this input means, The 2nd image area separation means processed in the block unit which consists of two or more pixels to this image, the time of the first image input -- this -- with a means to memorize the separation result of the 2nd image area separation means It is characterized by having a means to judge the property of the predetermined field of this image based on the separation result of each of said image area separation means, and to judge the property of the predetermined field of this image based on the separation result of said 1st image area separation means, and the separation result of said storage means at the time of reinput of an image at the time of the first image input.

[0010] In invention according to claim 3, said 1st image area separation means is characterized by separating an edge field per pixel.

[0011] In invention according to claim 4, said 2nd image area separation means is characterized by separating a halftone dot field per block.

[0012] In invention according to claim 5, said 2nd image area separation means is characterized by separating a white field per block.

[0013] In invention according to claim 6, said 2nd image area separation means is characterized by separating a photograph field per block.

[0014] In invention according to claim 7, said 2nd image area separation means is characterized by separating a color field per block.

[0015]

[Function] In this invention, the judgment of (1) edge separation is performed per pixel, and it judges for every scan.

[0016] (2) Judgments other than edge separation (that is, halftone dot separation, white separation, photograph separation, color separation) perform separation processing per block, and store the separation result at the time of a first scan in memory.

[0017] A final black alphabetic character field and a final color alphabetic character field are detected for every pixel combining (1) and (2). Namely, if separation results differ for every scan, image quality degradation will store only the remarkable large separation result of a block unit in memory, and will reuse at the time of the scan on and after next time.

[0018]

[Example] Hereafter, one example of this invention is concretely explained using a drawing. Drawing 1 shows the configuration of the example 1 of this invention. drawing -- setting -- 1 -- picture input devices, such as a scanner, and 2 -- a reflection factor -- a linear signal -- concentration -- the Log conversion circuit changed into a linear signal -- The filter circuit where 3 consists of a smoothing filter and an edge enhancement filter, the color correction circuit where 4 changes a cmy signal into YMC of the complementary color, The UCR circuit which performs processing which subtracts 5 from the signal of each color material by K signal, and 6 For alphabetic characters, The dither circuit which expresses halftone using the dither for patterns, the edge separation circuit where 7 separates an alphabetic character edge out of a manuscript, The halftone dot separation circuit where 8 separates a halftone dot out of a manuscript, the color separation circuit where 9 separates a color field out of a manuscript, The storage with which 10 memorizes the halftone dot separation information at the time of the first scan, and color separation information, The multiplexer which 11 and 12 choose the output of a halftone dot separation circuit and a color separation circuit at the time of the first scan, and chooses the output of a store at the time of the scan of the 2nd henceforth, the judgment circuit where 13

judges a field based on the separation result of a separation circuit, and 14 are image output units, such as a printer.

[0019] First, the outline of the example shown in drawing 1 is explained. The manuscript which is not illustrated by the picture input devices 1, such as a scanner, is read, and linear RGB data (RGB is 8 bits each) are outputted in general to a reflection factor. next -- as pretreatment which performs latter color correction -- the Log conversion circuit 2 -- setting -- logarithmic transformation -- carrying out -- concentration -- linear cmy data are generated.

[0020] A filter circuit 3 consists of circuits where the smoothing filter as shown in drawing 2 (a) and (b), and the edge enhancement filter were connected to the serial, when the signals from the judgment circuit 13 mentioned later are a black alphabetic character and a color alphabetic character, makes a smoothing filter through and performs only edge enhancement processing.

[0021] The color correction circuit 4 changes a cmy signal into the YMC signal of the complementary color in consideration of the property of a picture input device 1 and the image output unit 14. A linear approximation ***** masking method, tetrahedron interpolation, triangle pole interpolation, etc. are proposed by the color correction approach, and color correction is performed using these approaches. At this time, K signal is computed from $\min(C, M, Y)$ to coincidence.

[0022] The UCR circuit 5 changes processing as follows based on the field judging signal from the judgment circuit 13. That is, about a black alphabetic character field, K is made through and it is made $C=M=Y=0$. About a color alphabetic character field, through [Y] is made [K] through for through [M], and it makes through [C] into $K'=0.6xKC'$ (M', Y') = $C(M, Y)-K'$ about the pattern field except the above that is,.

[0023] And in the dither circuit 6, two kinds of dither tables (dither matrix) on which sizes differ are prepared (not shown), when the signals from the judgment circuit 13 are a black alphabetic character and a color alphabetic character, it processes on a dither table with small size (for example, 1x1), it processes on a dither table with size big when other (for example, 2x2), and data are sent to the image output unit 14.

[0024] The image area separation section which are the main description parts of this invention is explained in full detail below. The image area separation section of an example 1 is equipped with the edge separation circuit 7, the halftone dot separation circuit 8, and the color separation circuit 9, among these edge separation processes per pixel, and halftone dot separation and color separation process per block so that it may mention later.

[0025] The edge separation circuit 7 is a circuit which detects an alphabetic character edge out of a manuscript. In this example, for example, the "edge field 4.2 Detection" approach indicated by the paper "the image area separation method of an alphabetic character / pattern (halftone dot, photograph) mixture image" (the Institute of Electronics, Information and Communication Engineers paper magazine refer to the Vol.J75-D11No.1 pp39-47 1992 year 1 month) is used as the detection approach of an alphabetic character edge.

[0026] After this approach gives edge enhancement to the input image data of 64 gradation, in a 5x5-pixel block, when all one or more both exist, they judge an attention block by forming 3 values with two sorts of fixed thresholds, and pattern matching detecting the continuity of the black pixel after the formation of 3 values, and a white pixel, to be an edge field, otherwise, a black continuation pixel and a white continuation pixel judge it to be a non-edge field. Here, an important thing is that a separation result changes per pixel, and moves the mask of separation judging processing by 1 pixel for the next judgment. Drawing 3 is drawing showing signs that separation processing is processed per pixel.

[0027] The halftone dot separation circuit 8 is a circuit which detects a halftone dot (printing) field out of a manuscript. The "halftone dot field 4.1 Detection" approach by which this detection approach was also indicated by the paper shown above is used. Concentration change of a color halftone dot field and monochrome halftone dot field performs detection of a peak pixel, detection of a halftone dot field, and amendment of a halftone dot field paying attention to a point different as greatly as concentration change of an alphabetic character field, and this approach separates a halftone dot field.

[0028] In a 3x3-pixel block, or the concentration level L of a main pixel is higher than it which are all surrounding pixels, it is low, and detection of a peak pixel makes a main pixel a peak pixel, when all four pairs of concentration level a and b of the pair pixel which exists in the diagonal line on both sides of L and a main pixel is $|2xL-a-b|>TH$ (threshold of immobilization). In four blocks which made 4x4 pixels the unit, if 2 blocks or more of blocks containing a peak pixel exist, detection of a halftone dot field will make an attention block a halftone dot candidate field, and will judge it except it to be a non-halftone dot candidate field. If 4 blocks or more are a halftone dot candidate field in nine blocks centering on an attention block after judging a halftone dot / non-halftone dot candidate field, make an attention block into a halftone dot field, otherwise, let an attention block be a non-halftone dot field.

[0029] Here, an important thing is that a separation result changes per block, and moves the mask of separation judging processing by 4 pixels for the next judgment. Drawing 4 is drawing showing signs that separation processing is processed per block.

[0030] The color separation circuit 9 is a circuit which detects the chromatic color section out of a manuscript. In this example, it judges whether an attention block is a chromatic color with two steps of following procedure. That is, at the 1st step, max (c-m, m-y, y-c) of an attention pixel is calculated, and when this value is larger than a predetermined threshold, an attention pixel is made into owner *****. At the 2nd step, in an attention block (4 pixels x 4 pixels), counting of the above-mentioned owner ***** is carried out, and when these enumerated data are larger than a predetermined threshold, an attention block is considered as a color block. This processing is also considered as block unit processing, and the mask of separation judging processing is moved by 4 pixels for the next judgment processing.

[0031] <Example 1> The image processing system of this example repeats four scans, and forms an image for whenever [the / every] in order of the K-th edition, the C version, the M-th edition, and the Y-th edition. First, at the time of a first scan, i.e., the K-th edition imaging, the edge separation circuit 7, the halftone dot separation circuit 8, and the color separation circuit 9 operate to parallel. A scanning control signal is inputted into multiplexers 11 and 12, and the output of the halftone dot separation circuit 8 and the output of the color separation circuit 9 are chosen at the time of a first scan.

[0032] Therefore, at the time of a first scan, a halftone dot separation result and a color separation result are written in storage 10, and it is held till the 4th future scans at the same time the separation result of each separation circuits 7, 8, and 9 inputs into the judgment circuit 13.

[0033] And after a second scan, the edge separation circuit 7 operates for every scan, and the separation result is inputted into the judgment circuit 13. Moreover, reading appearance of the content of the store 10 is carried out for every scan, and multiplexers 11 and 12 choose the output from a store 10. Therefore, after a second scan, the output of the halftone dot separation circuit 8 and the color separation circuit 9 is disregarded, and the halftone dot separation result and color separation result which were stored at the time of the output by which reading appearance is carried out from storage 10, i.e., a first scan, are inputted into the judgment circuit 13.

[0034] Supposing it reads the memory space of storage 10 by 16 pixels per mm with this equipment, in the manuscript (297mmx210mm) of A4 size by the way, the amount of [of halftone dot separation] result Since it is processed per block, since a part for the result of $x(297 \times 4)$ (210×4) = 997920-bit color separation is also processed per block (297×4) Although it becomes $x(210 \times 4)$ = 997920 bit and a total of 1995840-bit memory space is needed, compared with the conventional thing, it is reduced substantially.

[0035] Moreover, the judgment circuit 13 performs the following judgments in response to the signal (respectively ON/OFF) of an edge separation result, a halftone dot separation result, and a color separation result. That is, a black alphabetic character field signal is generated by edge separation (ON) & halftone dot separation (OFF) & color separation (OFF), by edge separation (ON) & halftone dot separation (off) & color separation (ON), a color alphabetic character field signal is generated and a pattern field signal is generated except [all] it. These field signal is inputted into a filter circuit 3, the UCR circuit 5, and the dither circuit 6, and as mentioned above, the optimal processing for each field is performed.

[0036] Although judged that the edge separation by this invention described above for every scan, it is as follows when the reason is arranged again. Edge separation must be judged per pixel, if the incorrect separation in a pattern is considered as the conventional technique having described. Of course, although edge separation also has a method of memorizing the separation result at the time of a first scan since judgment results may differ for every scan, the separation result of a pixel unit becomes the huge amount of data, the amount of memory for storing it also increases, and expensive rank-ization is not avoided. Extent of image quality degradation which originates in separation results differing for every scan on the other hand has a farther [than that of a pixel unit] large direction in case judgments differ per block. In other words, it can be said that edge separation does not become a problem so much even if judgment results differ somewhat for every scan.

[0037] <Example 2> Drawing 5 shows the configuration of the example 2 of this invention. The halftone dot separation circuit 8 of an example 1 is transposed to the white separation circuit 15, and consists of this examples. This is for dividing only an alphabetic character edge into high degree of accuracy, detects a big white lump with high possibility of existing in an alphabetic character background, and uses this information for image area separation. Since actuation of an example 2 is the same as that of an example 1, the explanation is omitted.

[0038] The white separation circuit 15 is a circuit which detects the white lump near the attention block out of a manuscript. In this example, it judges whether an attention block is a white block with the procedure of the following three-stage. That is, at the 1st step, max (c, m, y) of an attention pixel is calculated, and when this value is smaller than a predetermined threshold, let an attention pixel be a white pixel. At the 2nd step, in an attention block (4 pixels x 4 pixels), counting of the above-mentioned white pixel is carried out, and when these enumerated data are larger than a predetermined threshold, let an attention block be a white block candidate. At the 3rd step, in 5 blocks as shown in drawing 6, if a white block candidate finds at least one, an attention block will be considered as a white block.

[0039] This processing is also considered as block unit processing, and the mask of separation judging processing is moved by 4 pixels for the next judgment processing.

[0040] The result of the white separation circuit 15 which is block unit processing, and it of the color separation circuit 9 are memorized to storage 10.

[0041] Moreover, the judgment circuit 13 performs the following judgments in response to the signal (respectively ON/OFF) of an edge separation result, a white separation result, and a color separation result. That is, a black alphabetic character field signal is generated by edge separation (ON) & white separation (ON) & color separation (OFF), by edge separation (ON) & white separation (ON) & color separation (ON), a color alphabetic character field signal is generated and a pattern field signal is generated except [all] it.

[0042] <Example 3> Drawing 7 shows the configuration of the example 3 of this invention. The halftone dot separation circuit of an example 1 is transposed to the photograph separation circuit 16, and consists of this examples. it will be for dividing only an alphabetic character edge into high degree of accuracy, and since many poor fields of medium level exist in a photograph, even if it judges with an edge field in an edge separation circuit, if this has a poor field in near, it will not be an alphabetic character edge -- like -- it uses for an image area separation judging. Since actuation of an example 3 is the same as that of an example 1, the explanation is omitted.

[0043] The photograph separation circuit 16 is a circuit which detects the photograph section near the attention block out of a manuscript. In this example, it judges whether an attention block is a photograph block with the procedure of the following three-stage. That is, at the 1st step, when the m value of an attention pixel fills $Th\ \alpha < m < Th\ \beta$ (threshold predetermined in $Th\ \alpha$ and $Th\ \beta$), let an attention pixel be a mean value pixel. At the 2nd step, in an attention block (4 pixels x 4 pixels), counting of the above-mentioned mean value pixel is carried out, and when these enumerated data are larger than a predetermined threshold, let an attention block be a photograph block candidate. At the 3rd step, in 5 blocks as shown in drawing 8, if a photograph block candidate finds at least one, an attention block will be considered as a photograph block.

[0044] This processing is also considered as block unit processing, and the mask of separation judging processing is moved by 4 pixels for the next judgment processing.

[0045] The result of the photograph separation circuit 16 which is block unit processing, and it of the color separation circuit 9 are memorized to storage 10.

[0046] Moreover, the judgment circuit 13 performs the following judgments in response to the signal (respectively ON/OFF) of an edge separation result, a photograph separation result, and a color separation result. That is, a black alphabetic character field signal is generated by edge separation (ON) & photograph separation (OFF) & color separation (OFF), by edge separation (ON) & photograph separation (off) & color separation (ON), a color alphabetic character field signal is generated and a pattern field signal is generated except [all] it.

[0047] In addition, this invention is not limited to the above-mentioned example, and various modification is possible for it. Namely, in the image area separation which is carried out in the block unit whose edge separation is 2x2 pixels, for example, and is carried out in the block unit whose color judging is 4x4 pixels, only a color judging is memorized to a store and an equipment configuration which operates for every scan is also possible for edge separation.

[0048] Or it is also possible to memorize all the separation results that are equipped with all the circuits of edge separation, halftone dot separation, white separation, photograph separation, and color separation, and process per block. Even if the precision which detects an alphabetic character edge out of an image improves by this and it memorizes halftone dot separation, white separation, photograph separation, and all the color separation (block which is four each 4 pixels) The amount of [of halftone dot separation] result the amount of [of x(297x4) (210x4) = 997920 bit white separation] result (297x4) The amount of [of x(210x4) = 997920 bit photograph separation] result (297x4) The amount of [of x(210x4) = 997920 bit color separation] result becomes x(297x4) (210x4) = 997920 bit, and operation of it is attained by total of 3991680-bit memory space. Memory space of this decreases compared with

the conventional thing.

[0049]

[Effect of the Invention]

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TECHNICAL FIELD

[Industrial Application] This invention is [in / about the image processing system equipped with the image area decollator for reproducing especially a black alphabetic character to high definition in the equipment which reproduces a color picture by Junji Men like a color copying machine 1 dram type / for example, / picture reproducers, such as a color copying machine and color facsimile,] an available technique.

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PRIOR ART

[Description of the Prior Art] In the color copying machine of the equipment which reproduces an image by the plane sequence following method conventionally, for example, a 1-dram type In obtaining the copy of one sheet from a manuscript, it performs four manuscript reading scans. For example, the blue (B) read by the 1st time and the Green black (K) signal are computed from each signal of (G) and red (R). The blue which reproduced the toner image of K and was read by the 2nd time from this (B), A Green cyanogen (C) signal is computed from each signal of (G) and red (R).

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EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, the 1st image area separation means which is performed per 2x2 pixels, for example according to invention according to claim 1 in case a color picture is reproduced with four scans as explained, In the image processing system which carries out a field judging in combination with the 2nd image area separation means performed per 4x4 pixels, and changes processing locally according to the result In order to save the separation result of the 2nd image area separation means at the time of a first scan at storage and to use for 2nd henceforth, When the separation result of having differed for every version is taken out, degradation by the 2nd image area separation means with larger image quality degradation is prevented, memory space can be lessened substantially and an image processing system with sufficient cost performance can be realized rather than it saves all separation results.

[0050] The 1st image area separation means which according to invention according to claim 2 is performed per 1x1 pixel, for example in case a color picture is reproduced with four scans, In the image processing system which carries out a field judging in combination with the 2nd image area separation means performed per 4x4 pixels, and changes processing locally according to the result

1

【特許請求の範囲】

【請求項1】 原稿を読み取って画像を入力する手段と、該入力手段からの画像に対して処理単位の異なる複数の像域を分離する手段と、最初の画像入力時に、該処理単位の内、最小の処理単位でない処理単位で処理する像域分離手段の分離結果を記憶する手段と、最初の画像入力時に、前記複数の像域分離手段の分離結果を基に該画像の所定領域の特性を判定し、画像の再入力時に、前記最小の処理単位で処理する像域分離手段の分離結果と前記記憶手段の分離結果とを基に該画像の所定領域の特性を判定する手段とを備えたことを特徴とする画像処理装置。

【請求項2】 原稿を読み取って画像を入力する手段と、該入力手段からの画像に対して画素単位で処理する第1の像域分離手段と、該画像に対して複数画素からなるブロック単位で処理する第2の像域分離手段と、最初の画像入力時に、該第2の像域分離手段の分離結果を記憶する手段と、最初の画像入力時に、前記各像域分離手段の分離結果を基に該画像の所定領域の特性を判定し、画像の再入力時に、前記第1の像域分離手段の分離結果と前記記憶手段の分離結果とを基に該画像の所定領域の特性を判定する手段とを備えたことを特徴とする画像処理装置。

【請求項3】 前記第1の像域分離手段は、画素単位にエッジ領域を分離することを特徴とする請求項2記載の画像処理装置。

【請求項4】 前記第2の像域分離手段は、ブロック単位に網点領域を分離することを特徴とする請求項2記載の画像処理装置。

【請求項5】 前記第2の像域分離手段は、ブロック単位に白地領域を分離することを特徴とする請求項2記載の画像処理装置。

【請求項6】 前記第2の像域分離手段は、ブロック単位に写真領域を分離することを特徴とする請求項2記載の画像処理装置。

【請求項7】 前記第2の像域分離手段は、ブロック単位に色領域を分離することを特徴とする請求項2記載の画像処理装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、例えば1ドラムタイプのカラー複写機のように面順次でカラー画像を再生する装置において、特に黒文字を高画質に再生するための像域分離装置を備えた画像処理装置に関し、カラー複写

機、カラーワークstationにおける画像再生装置において利

(2)

特開平8-307717

2

り走査を行い、例えば1回目で読み取ったブルー（B）、グリーン（G）、レッド（R）の各信号からブラック（K）信号を算出し、これよりKのトナー像を再生し、2回目で読み取ったブルー（B）、グリーン（G）、レッド（R）の各信号からシアン（C）信号を算出し、これよりCのトナー像を再生し、3回目で読み取ったブルー（B）、グリーン（G）、レッド（R）の各信号からマゼンタ（M）信号を算出し、これよりMのトナー像を再生し、4回目で読み取ったブルー（B）、グリーン（G）、レッド（R）の各信号からイエロー（Y）信号を算出し、これよりYのトナー像を再生し、これらK、C、M、Yのトナー像を重ね合わせることでフルカラー画像を作成する。

【0003】ところで、黒文字エッジ領域は黒単色で再生することが、画像品質上好ましい。これを実現するために、一般的には読み込んだ画像に対し、像域分離処理を施し、黒文字領域と判定された領域においては、C、M、Yのトナーを打たないように制御する。

【0004】しかしながら、各版をつくる毎に、すなわち4回の像域分離を行った場合、原稿中の所定のポイントを全て同じ信号で読み込むことは、現在の技術では不可能に近い。版ごとに分離結果が異なるといったことが起こる。この結果、文字や絵柄中の黒エッジに色にじみを起こしたり、黒エッジが消えたり（CMY版時に黒文字と判定され、K版時に絵柄と判定された場合、絵柄部のKは一般的に低い）といったような画質を劣化させる現象が発生した。

【0005】これを解決するものとして、例えば特開平3-225376号公報に記載されたカラー画像読み取り装置がある。この装置では、ブリスキャン時に黒文字領域あるいは色文字領域と判定された領域を、次の読み取りまでメモリに記憶しておくことにより、版毎に判定が異なるという、前述した問題を回避している。

【0006】

【発明が解決しようとする課題】 しかし、上記した装置ではA4サイズ（297mm×210mm）において、1mm当たり16画素で読み取るとすると、 $(297 \times 16) \times (210 \times 16) = 15966720$ ビット（16Mビット）のメモリ容量が必要となる。そこで、メモリ容量を削減するために、黒文字領域をブロック単位、例えば4×4画素程度のブロック単位で記憶する方法も考えられるが、絵の中で黒文字と間違えて判定した場合には、画質の劣化が甚だしい。すなわち、この現象を詳述すると、絵の中で誤分離を起こす箇所は、通

(3)

特開平8-307717

3

もので、本発明の目的は、スキャン毎に異なる分離結果に起因する画質の劣化を低減しつつ、必要なメモリ容量を削減した画像処理装置を提供することにある。

【0008】

【課題を解決するための手段】前記目的を達成するために、請求項1記載の発明では、原稿を読み取って画像を入力する手段と、該入力手段からの画像に対して処理単位の異なる複数の像域を分離する手段と、最初の画像入力時に、該処理単位の内、最小の処理単位でない処理単位で処理する像域分離手段の分離結果を記憶する手段と、最初の画像入力時に、前記複数の像域分離手段の分離結果を基に該画像の所定領域の特性を判定し、画像の再入力時に、前記最小の処理単位で処理する像域分離手段の分離結果と前記記憶手段の分離結果とを基に該画像の所定領域の特性を判定する手段とを備えたことを特徴としている。

【0009】請求項2記載の発明では、原稿を読み取って画像を入力する手段と、該入力手段からの画像に対して画素単位で処理する第1の像域分離手段と、該画像に対して複数画素からなるブロック単位で処理する第2の像域分離手段と、最初の画像入力時に、該第2の像域分離手段の分離結果を記憶する手段と、最初の画像入力時に、前記各像域分離手段の分離結果を基に該画像の所定領域の特性を判定し、画像の再入力時に、前記第1の像域分離手段の分離結果と前記記憶手段の分離結果とを基に該画像の所定領域の特性を判定する手段とを備えたことを特徴としている。

【0010】請求項3記載の発明では、前記第1の像域分離手段は、画素単位にエッジ領域を分離することを特徴としている。

【0011】請求項4記載の発明では、前記第2の像域分離手段は、ブロック単位に網点領域を分離することを特徴としている。

【0012】請求項5記載の発明では、前記第2の像域分離手段は、ブロック単位に白地領域を分離することを特徴としている。

【0013】請求項6記載の発明では、前記第2の像域分離手段は、ブロック単位に写真領域を分離することを特徴としている。

【0014】請求項7記載の発明では、前記第2の像域分離手段は、ブロック単位に色領域を分離することを特徴としている。

【0015】

【作用】本発明では、

(1) 画像の分離の判定は画素単位で行い、各画素の

4

【0017】(1)と(2)を組み合わせる最終的な黒文字領域と色文字領域を、画素毎に検出する。すなわち、各スキャン毎に分離結果が異なると、画質劣化が著しく大きい、ブロック単位の分離結果のみをメモリに蓄えて、次回以降のスキャン時に再利用する。

【0018】

【実施例】以下、本発明の一実施例を図面を用いて具体的に説明する。図1は、本発明の実施例1の構成を示す。図において、1はスキャナなどの画像入力装置、2は反射率リニアな信号を濃度リニアな信号に変換するLog変換回路、3は平滑化フィルタ、エッジ強調フィルタからなるフィルタ回路、4はcmy信号を補色のYMCに変換する色補正回路、5はK信号分だけ各色の信号から減じる処理を行うUCR回路、6は文字用、絵柄用のディザを用いて中間調を表現するディザ回路、7は原稿中から文字エッジを分離するエッジ分離回路、8は原稿中から網点を分離する網点分離回路、9は原稿中から色領域を分離する色分離回路、10は最初のスキャン時における網点分離情報、色分離情報を記憶する記憶装置、11、12は最初のスキャン時に、網点分離回路と色分離回路の出力を選択し、2回目以降のスキャン時に、記憶装置の出力を選択するマルチプレクサ、13は分離回路の分離結果を基に領域を判定する判定回路、14はプリンタなどの画像出力装置である。

【0019】まず、図1に示す実施例の概要を説明する。スキャナなどの画像入力装置1によって図示しない原稿が読み取られ、概ね反射率に対しリニアなRGBデータ(RGBが各8ビット)が出力される。次に、後段の色補正を行う前処理としてLog変換回路2において対数変換を行い、濃度リニアなcmyデータを生成する。

【0020】フィルタ回路3は、図2(a)、(b)に示すような平滑化フィルタとエッジ強調フィルタが直列に接続された回路で構成され、後述する判定回路13からの信号が、黒文字、色文字である場合には、平滑化フィルタをスルーにしてエッジ強調処理のみを施す。

【0021】色補正回路4は、画像入力装置1と画像出力装置14の特性を考慮し、cmy信号を補色のYMC信号に変換する。色補正方法には線形近似いわゆるマスキング法や四面体補間法、三角柱補間法などが提案されていて、これらの方法を利用して色補正を行う。このとき同時にK信号は、m+n(C, M, Y)から算出する。

【0022】UCR回路5は、判定回路13からの領域判定信号に基づいて、補正後のcmy信号にK信号を加算する。

(4)

特開平8-307717

5

Yをスルーにし、上記以外つまり絵柄領域については

$$K' = 0.6 \times K$$

$$C'(M', Y') = C(M, Y) - K'$$

【0023】そして、ディザ回路6では、サイズの異なる2種類のディザテーブル（ディザマトリックス）を準備し（図示せず）、判定回路13からの信号が、黒文字、色文字である場合には、サイズの小さなディザテーブル（例えば1×1）で処理を行い、それ以外の場合にはサイズの大きなディザテーブル（例えば2×2）で処理を施して画像出力装置14にデータを送る。

【0024】本発明の主要な特徴部分である像域分離部について、以下詳述する。後述するように、実施例1の像域分離部は、エッジ分離回路7と、網点分離回路8と、色分離回路9を備え、このうちエッジ分離は、画素単位に処理を行い、網点分離と色分離はブロック単位で処理を行う。

【0025】エッジ分離回路7は、原稿中から文字エッジを検出する回路である。本実施例では、文字エッジの検出方法として、例えば、論文「文字／絵柄（網点、写真）混在画像の像域分離方式」（電子情報通信学会論文誌 Vol.J75-D11 No.1 pp39-47 1992年1月を参照）に記載された、「4.2 エッジ領域検出」方法を用いる。

【0026】この方法は、64階調の入力画像データにエッジ強調を施した後、2種の固定閾値で3値化し、3値化後の黒画素と白画素の連続性をパターンマッチングによって検出し、5×5画素のブロック内において黒連続画素および白連続画素が両者とも1個以上存在する場合、注目ブロックをエッジ領域と判定し、そうでなければ非エッジ領域と判定する。ここで、重要なことは、分離結果が画素単位で切り替わることであり、次の判定のために分離判定処理のマスクを1画素分だけ移動させる。図3は、分離処理が画素単位で処理される様子を示す図である。

【0027】網点分離回路8は、原稿中から網点（印刷）領域を検出する回路である。この検出方法も、前掲した論文に記載された、「4.1 網点領域検出」方法を用いる。この方法は、カラー網点領域と白黒網点領域の濃度変化は文字領域の濃度変化と大きく異なる点に着目し、ピーク画素の検出、網点領域の検出、網点領域の補正を行い、網点領域を分離するものである。

【0028】ピーク画素の検出は、例えば、3×3画素のブロックにおいて、中心画素の濃度レベルLが周囲のすべての画素のそれよりも高い、あるいは低く、かつ、Lと中心画素を挟む2つの対角線に存在する対角画素の濃度L1

6

領域とし、それ以外は非網点候補領域と判定する。網点／非網点候補領域を判定した後、注目ブロックを中心とした9つのブロックにおいて4ブロック以上が網点候補領域であれば、注目ブロックを網点領域とし、そうでなければ注目ブロックを非網点領域とする。

【0029】ここで、重要なことは、分離結果がブロック単位で切り替わることであり、次の判定のために分離判定処理のマスクを4画素分だけ移動させる。図4は、分離処理がブロック単位で処理される様子を示す図である。

【0030】色分離回路9は、原稿中から有彩色部を検出する回路である。本実施例では、次の2段階の処理手順によって注目ブロックが有彩色であるか否かを判定する。すなわち、第1のステップでは、注目画素のmax(c-m, m-y, y-c)を求め、この値が所定の閾値よりも大きい場合、注目画素を有彩色画素とする。第2ステップでは、注目ブロック（4画素×4画素）において、上記有彩色画素を計数し、この計数値が所定の閾値よりも大きい場合、注目ブロックを色ブロックとする。この処理もブロック単位処理とし、次の判定処理のために分離判定処理のマスクを4画素分だけ移動させる。

【0031】（実施例1）本実施例の画像処理装置は、4回のスキャンを繰返し、その度毎に、K版、C版、M版、Y版の順番で作像する。まず、ファーストスキャンすなわち、K版作像時にはエッジ分離回路7、網点分離回路8、色分離回路9がバラレルに作動する。マルチプレクサ11、12にはスキャン制御信号が入力され、ファーストスキャン時には、網点分離回路8の出力、色分離回路9の出力を選択する。

【0032】従って、ファーストスキャン時には、判定回路13に各分離回路7、8、9の分離結果が入力すると同時に、網点分離結果と色分離結果が記憶装置10に書き込まれ、以後の4回目のスキャン時まで保持される。

【0033】そして、セカンドスキャン以降は、各スキャン毎にエッジ分離回路7が動作し、その分離結果が判定回路13に入力される。また、各スキャン毎に記憶装置10の内容が読み出され、マルチプレクサ11、12は記憶装置10からの出力を選択する。従って、セカンドスキャン以降は、網点分離回路8と色分離回路9の出力が無視され、記憶装置10から読み出される出力、つまりファーストスキャン時に格納された網点分離結果と色分離結果が判定回路13に入力される。

【0034】ところで、記憶装置10のメモリ容量は、その結果を44ビットの距離（2の22乗）×21ビット

7

で、

$(297 \times 4) \times (210 \times 4) = 997920$ ビットとなり、合計1995840ビットのメモリ容量が必要となるが、従来のものに比べて大幅に削減される。

【0035】また、判定回路13は、エッジ分離結果、網点分離結果、色分離結果の信号（それぞれオン／オフ）を受けて、次のような判定を行う。すなわち、エッジ分離（オン）＆網点分離（オフ）＆色分離（オフ）によって黒文字領域信号を発生し、エッジ分離（オン）＆網点分離（オフ）＆色分離（オン）によって色文字領域信号を発生し、それ以外は全て、絵柄領域信号を発生する。これら領域信号がフィルタ回路3、UCR回路5、ディザ回路6に入力され、前述したように、各領域に最適な処理が施される。

【0036】上記したように本発明でのエッジ分離は、各スキャン毎に判定しているが、その理由を再度、整理すると次の通りである。エッジ分離は、従来技術で述べたように絵柄の中の誤分離を考慮すると、画素単位で判定せざるを得ない。もちろんエッジ分離も各スキャン毎に判定結果が異なる可能性があるため、ファーストスキャン時の分離結果を記憶しておく方法もあるが、画素単位の分離結果は膨大なデータ量になり、それを格納するためのメモリ量も多くなり、高価格化が避けられない。その一方で、各スキャン毎に分離結果が異なることに起因する画質劣化の程度は、ブロック単位で判定が異なる場合の方が、画素単位のそれよりもはるかに大きい。言い換えると、エッジ分離は、判定結果が各スキャン毎に多少異なっても、さほど問題にならないと云える訳である。

【0037】〈実施例2〉図5は、本発明の実施例2の構成を示す。本実施例では、実施例1の網点分離回路8を白地分離回路15に置き換えて構成している。これは、文字エッジだけを高精度に分離するためであり、文字背景に存在する可能性が高い、大きな白塊を検出し、この情報を像域分離に利用するものである。実施例2の動作は、実施例1と同様であるので、その説明は省略する。

【0038】白地分離回路15は、原稿中から注目ブロック近傍の白塊を検出する回路である。本実施例では、次の3段階の処理手順によって注目ブロックが白地ブロックであるか否かを判定する。すなわち、第1のステップでは、注目画素の $\max(c, m, y)$ を求め、この値が所定の閾値よりも小さい場合、注目画素を白画素とする。第2ステップでは、注目ブロック（4画素×4画素）において、上記中間値画素を計

(5)

特開平8-307717

8

定処理のために分離判定処理のマスクを4画素分だけ移動させる。

【0040】ブロック単位処理である白地分離回路15の結果と色分離回路9のそれを記憶装置10に記憶する。

【0041】また、判定回路13は、エッジ分離結果、白地分離結果、色分離結果の信号（それぞれオン／オフ）を受けて、次のような判定を行う。すなわち、エッジ分離（オン）＆白地分離（オン）＆色分離（オフ）によって黒文字領域信号を発生し、エッジ分離（オン）＆白地分離（オン）＆色分離（オン）によって色文字領域信号を発生し、それ以外は全て、絵柄領域信号を発生する。

【0042】〈実施例3〉図7は、本発明の実施例3の構成を示す。本実施例では、実施例1の網点分離回路を写真分離回路16に置き換えて構成している。これは、文字エッジだけを高精度に分離するためであり、写真には中間レベルのべた領域が多く存在することから、エッジ分離回路でエッジ領域と判定しても、べた領域が近傍にあれば、文字エッジではないといったような像域分離判定に利用するものである。実施例3の動作は、実施例1と同様であるので、その説明は省略する。

【0043】写真分離回路16は、原稿中から注目ブロック近傍の写真部を検出する回路である。本実施例では、次の3段階の処理手順によって注目ブロックが写真ブロックであるか否かを判定する。すなわち、第1のステップでは、注目画素の m 値が、 $Th_{\alpha} < m < Th_{\beta}$ （ Th_{α} 、 Th_{β} は所定の閾値）を満たす場合、注目画素を中間値画素とする。第2ステップでは、注目ブロック（4画素×4画素）において、上記中間値画素を計数し、この計数値が所定の閾値よりも大きい場合、注目ブロックを写真ブロック候補とする。第3ステップでは、図8に示すような5ブロックの中で、1つでも写真ブロック候補が見つければ、注目ブロックを写真ブロックとする。

【0044】この処理もブロック単位処理とし、次の判定処理のために分離判定処理のマスクを4画素分だけ移動させる。

【0045】ブロック単位処理である写真分離回路16の結果と色分離回路9のそれを記憶装置10に記憶する。

【0046】また、判定回路13は、エッジ分離結果、写真分離結果、色分離結果の信号（それぞれオン／オフ）を受けて、次のような判定を行う。すなわち、エッジ分離（オン）＆写真分離（オン）＆色分離（オフ）によって黒文字領域信号を発生し、エッジ分離（オン）＆写真分離（オン）＆色分離（オン）によって色文字領域信号を発生し、それ以外は全て、絵柄領域信号を発生する。

9

るものではなく、種々の変更が可能である。すなわち、例えばエッジ分離が 2×2 画素のブロック単位で実施され、色判定が 4×4 画素のブロック単位で実施される像域分離の場合、色判定のみを記憶装置に記憶し、エッジ分離は各スキャン毎に作動するような装置構成も可能である。

【0048】あるいは、エッジ分離、網点分離、白地分離、写真分離、色分離のすべての回路を備え、ブロック単位で処理を行う分離結果をすべて記憶することも可能である。これにより、画像中から文字エッジを検出する精度が向上し、網点分離、白地分離、写真分離、色分離（各 4×4 画素のブロック）のすべてを記憶したとしても、網点分離の結果分が、

$(297 \times 4) \times (210 \times 4) = 997920$ ビット
白地分離の結果分が、

$(297 \times 4) \times (210 \times 4) = 997920$ ビット
写真分離の結果分が、

$(297 \times 4) \times (210 \times 4) = 997920$ ビット
色分離の結果分が、

$(297 \times 4) \times (210 \times 4) = 997920$ ビット
となり、合計 3991680 ビットのメモリ容量で実施可能となる。これでも、従来のものに比べてメモリ容量が少なくなる。

【0049】

【発明の効果】以上、説明したように、請求項1記載の発明によれば、例えば、4回のスキャンでカラー画像を再生する際、 2×2 画素単位で行う第1の像域分離手段と、 4×4 画素単位で行う第2の像域分離手段との組み合わせで領域判定し、その結果に応じて局所的に処理を切り替える画像処理装置において、ファーストスキャン時の第2の像域分離手段の分離結果を記憶装置に保存し、2回目以降に利用するため、版毎に異なった分離結果を出した場合、画質劣化の大きい方の第2の像域分離手段による劣化を防ぎ、全部の分離結果を保存するよりも、メモリ容量を大幅に少なくすることができ、コストパフォーマンスのよい画像処理装置を実現することができる。

【0050】請求項2記載の発明によれば、例えば、4回のスキャンでカラー画像を再生する際、 1×1 画素単位で行う第1の像域分離手段と、 4×4 画素単位で行う第2の像域分離手段との組み合わせで領域判定し、その結果に応じて局所的に処理を切り替える画像処理装置において、ファーストスキャン時の第2の像域分離手段の分離結果を記憶装置に保存し、2回目以降に利用するた

(6)

特開平8-307717

10

くすることができ、コストパフォーマンスのよい画像処理装置を実現することができる。

【0051】請求項3記載の発明によれば、画素単位で処理を行うエッジ分離結果を記憶していないので、メモリ容量が削減され、従ってメモリコストを節約することができる。また、画素単位で行う判定結果が、版スキャン毎に異なった結果を出力しても画質劣化の被害が少ない。

【0052】請求項4記載の発明によれば、スキャン毎に網点分離の結果が異なることに起因する、例えば絵柄中の色ばけ現象などを防止することができる。

【0053】請求項5記載の発明によれば、スキャン毎に白地分離の結果が異なることに起因する、例えば絵柄中の色ばけ現象などを防止することができる。

【0054】請求項6記載の発明によれば、スキャン毎に写真分離の結果が異なることに起因する、例えば絵柄中の色ばけ現象などを防止することができる。

【0055】請求項7記載の発明によれば、スキャン毎に色分離の結果が異なることに起因する、例えば黒文字の色付き現象などを防止することができる。

【図面の簡単な説明】

【図1】本発明の実施例1の構成を示す。

【図2】フィルタ回路例を示し、(a)は平滑化フィルタであり、(b)はエッジ強調フィルタである。

【図3】分離処理が画素単位で処理される様子を示す図である。

【図4】分離処理がブロック単位で処理される様子を示す図である。

【図5】本発明の実施例2の構成を示す。

【図6】白地ブロックの判定を説明する図である。

【図7】本発明の実施例3の構成を示す。

【図8】写真ブロックの判定を説明する図である。

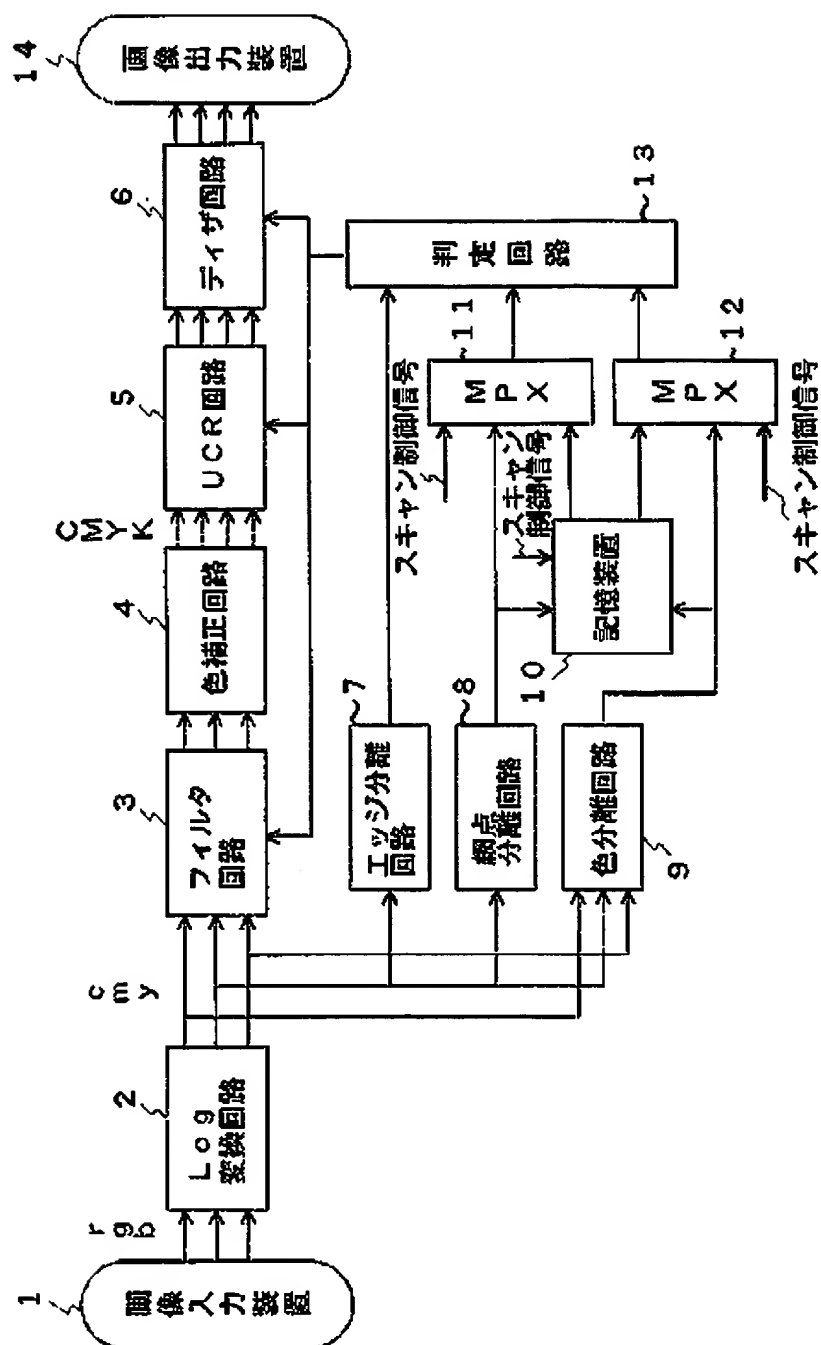
【符号の説明】

- 1 画像入力装置
- 2 ログ変換回路
- 3 フィルタ回路
- 4 色補正回路
- 5 UCR回路
- 6 ディザ回路
- 7 エッジ分離回路
- 8 網点分離回路
- 9 色分離回路
- 10 記憶装置
- 11, 12 マルチプレクサ
- 13 制御回路

特開平8-307717

(3)

【图 1】



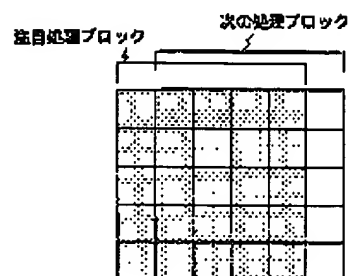
(8)

特開平8-307717

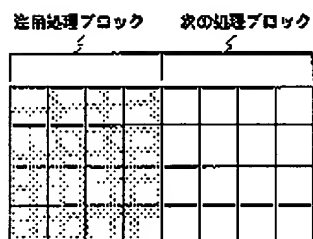
【図2】

(a)					(b)				
1	2	2	2	1	0	-1	-4	-1	0
2	4	4	4	2	-2	-8	36	-8	-2
1	2	2	2	1	0	-1	-4	-1	0

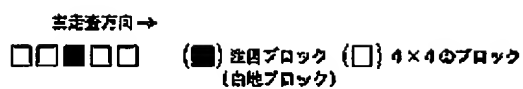
【図3】



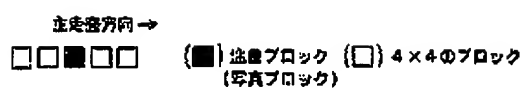
【図4】



【図6】



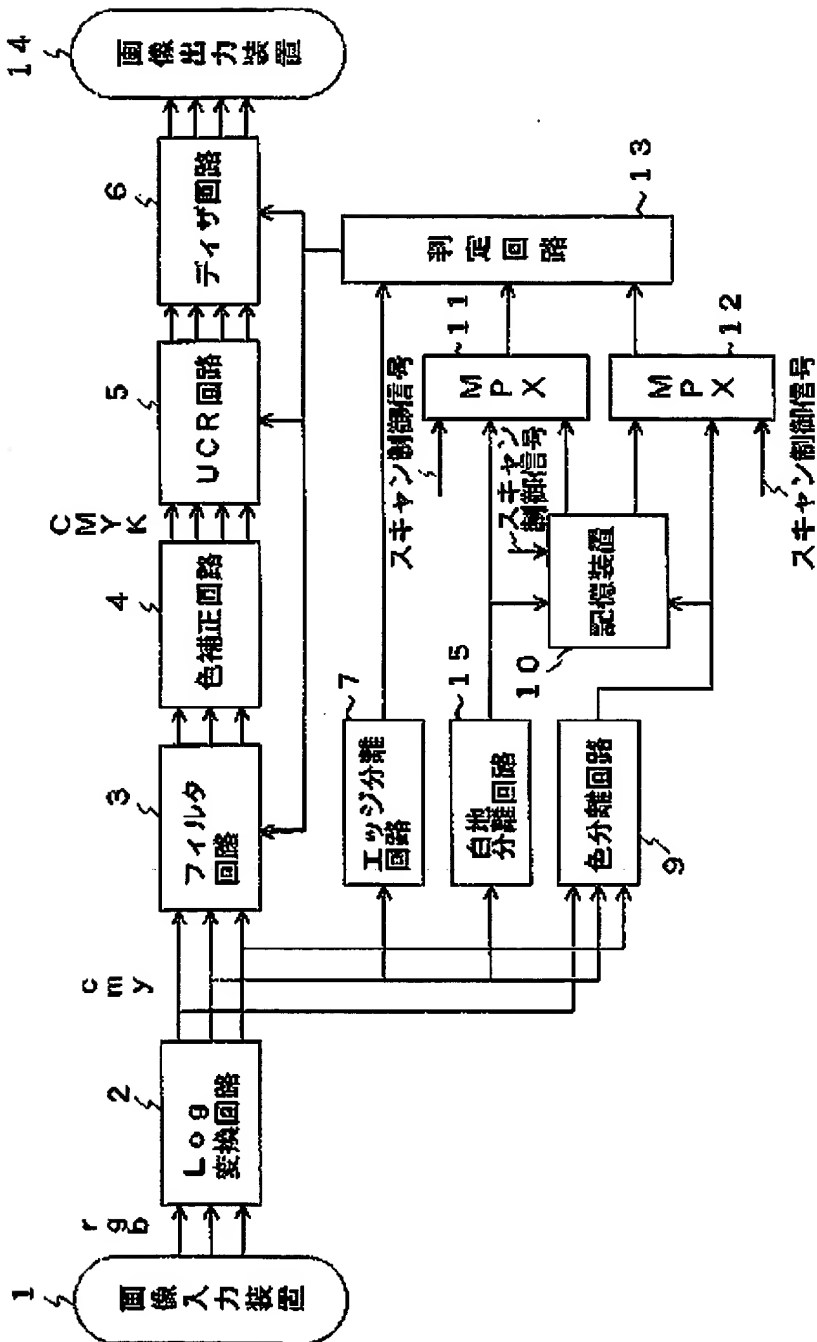
【図8】



特開平8-307717

(9)

【図5】



(10)

特開平8-307717

【図7】

